

VIRTUAL PRIVATE NETWORK (VPN) WITH CHANNELIZED
ETHERNET OVER SONET (EoS) INTERFACE AND METHOD

Inventor: Paul F. Havala
Serial No.: 10/656,702
Attorney's Docket: 064731.0389

Filed: September 6, 2003
Sheet 1 of 16

1/16

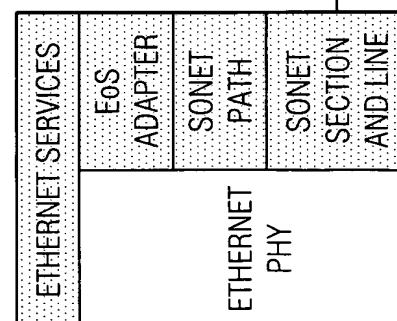
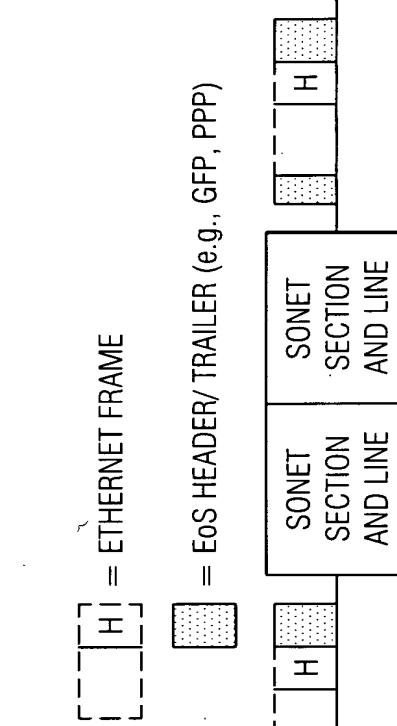
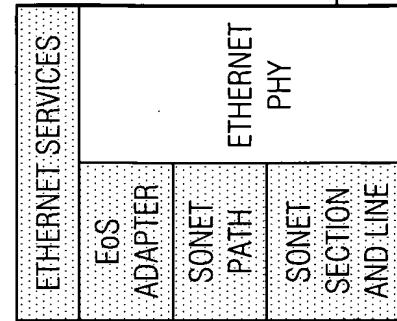
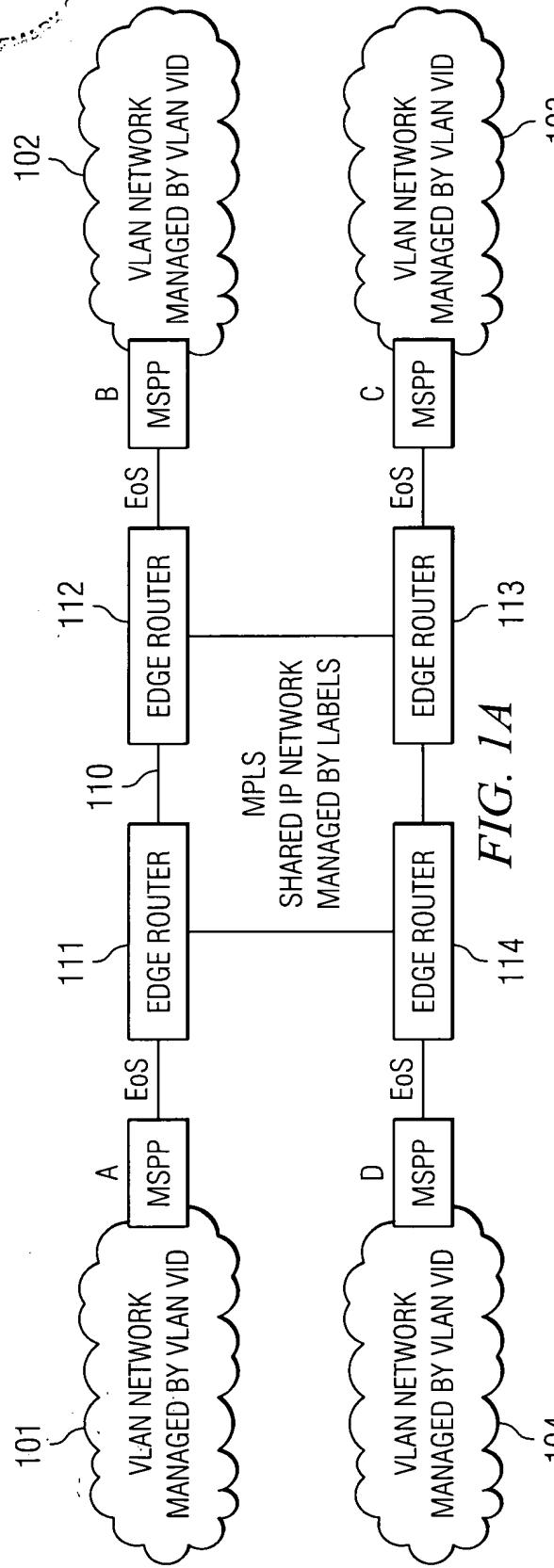


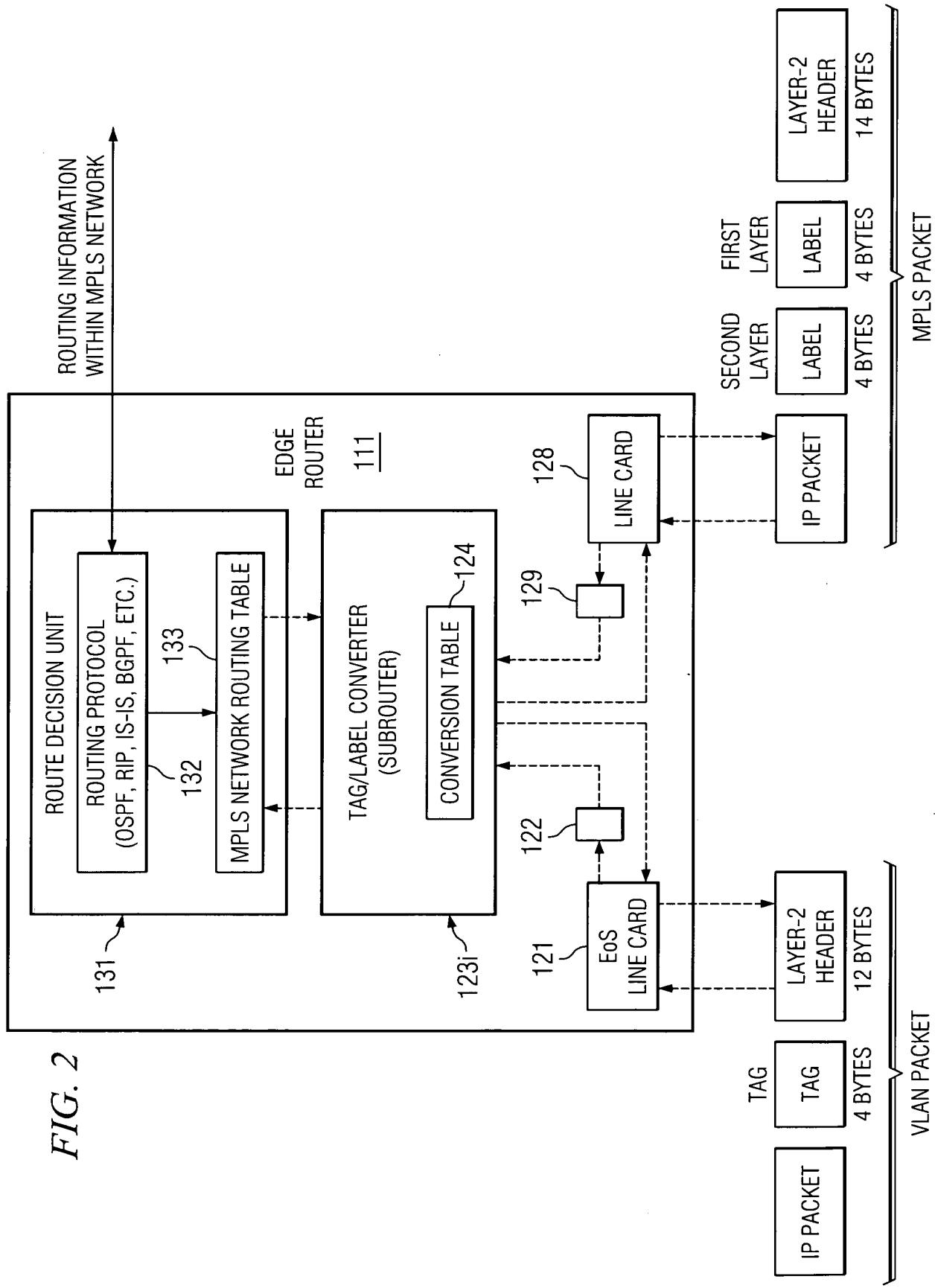
FIG. 1B

VIRTUAL PRIVATE NETWORK (VPN) WITH CHANNELIZED
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Sheet 2 of 16

2/16



**VIRTUAL PRIVATE NETWORK (VPN) WITH CHANNELIZED
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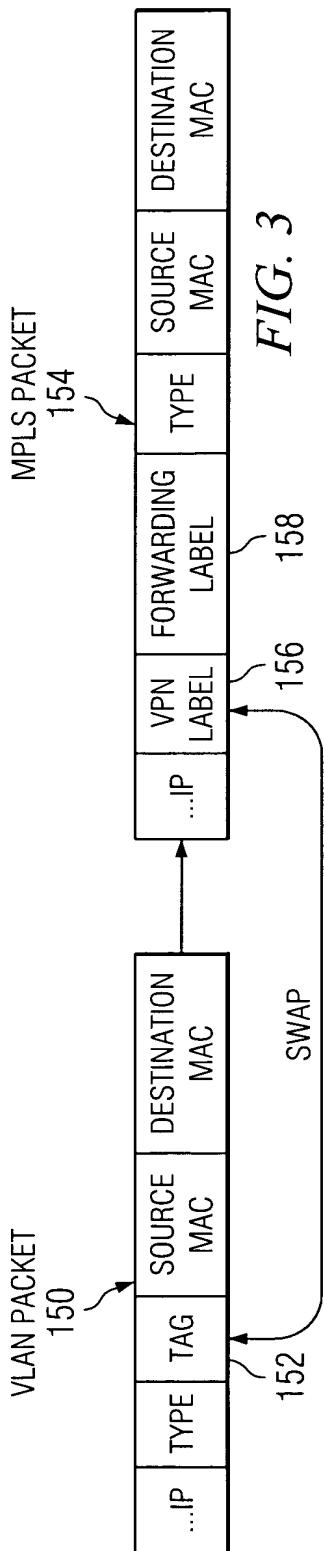
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Sheet 3 of 16

3/16



OUTGOING VF	EoS I/F (PORT)	EoS SUB I/F (CHANNELS)
EoS 0	1	1-6
EoS 1	1	7
EoS 2	2	1
⋮	⋮	⋮
EoS N		

VLAN ID (VID)	VPN LABEL
N	M
N+1	M+1
⋮	⋮
N	M

FIG. 4A **FIG. 4B**

4/16

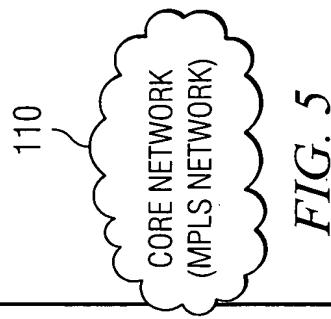
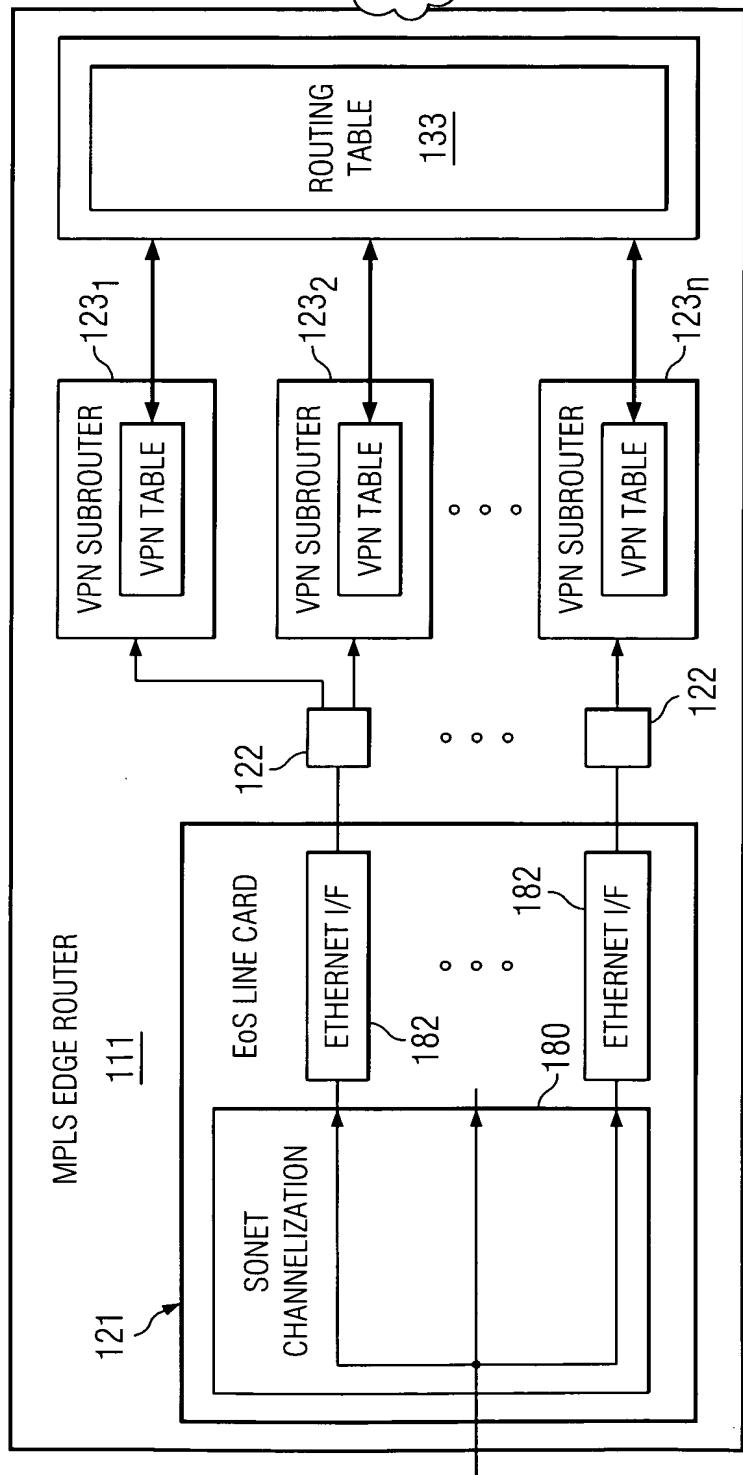


FIG. 5



VIRTUAL PRIVATE NETWORK (VPN) WITH CHANNELIZED ETHERNET OVER SONET (EoS) INTERFACE AND METHOD

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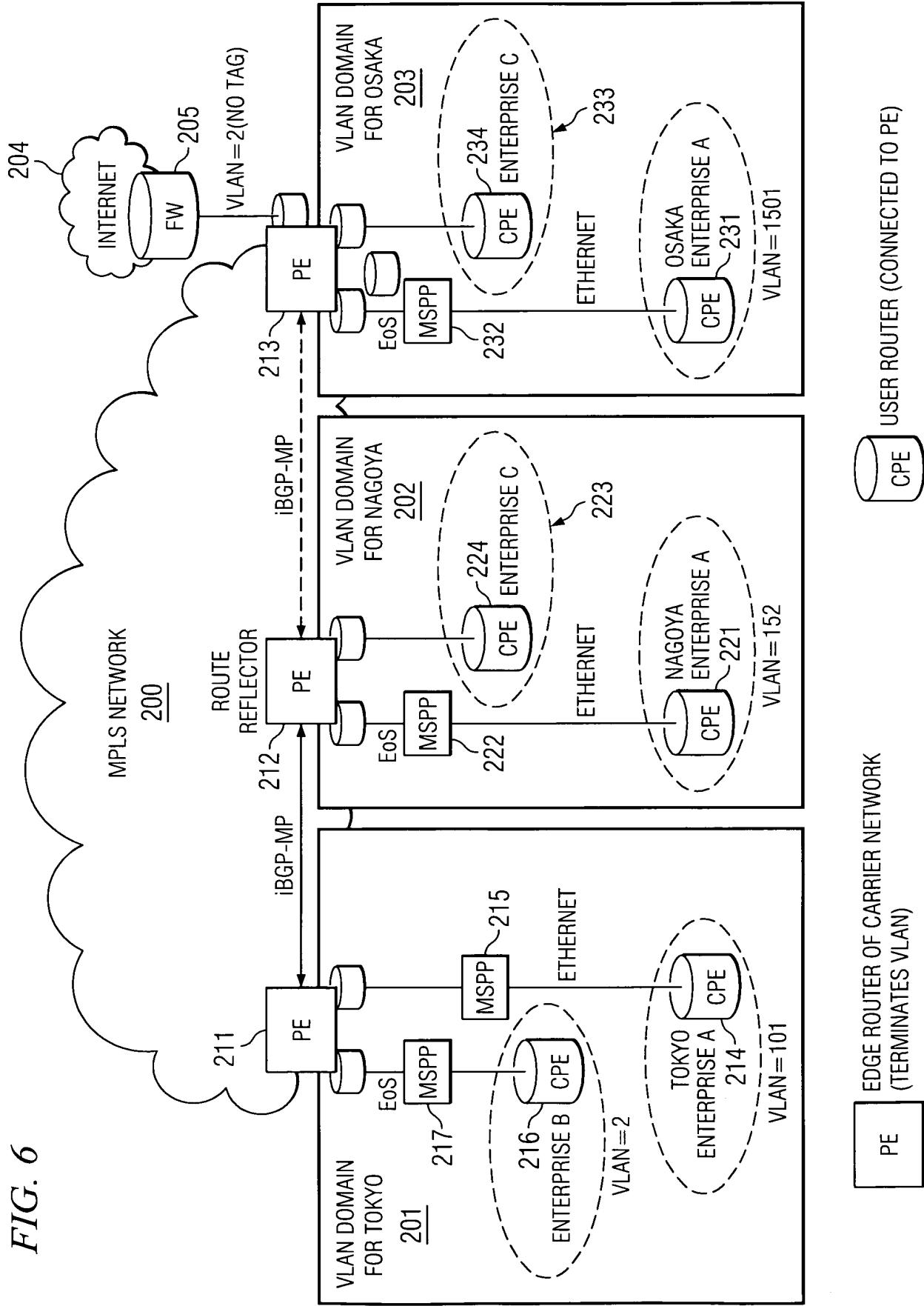
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Sheet 5 of 16

5/16

FIG. 6



6/16

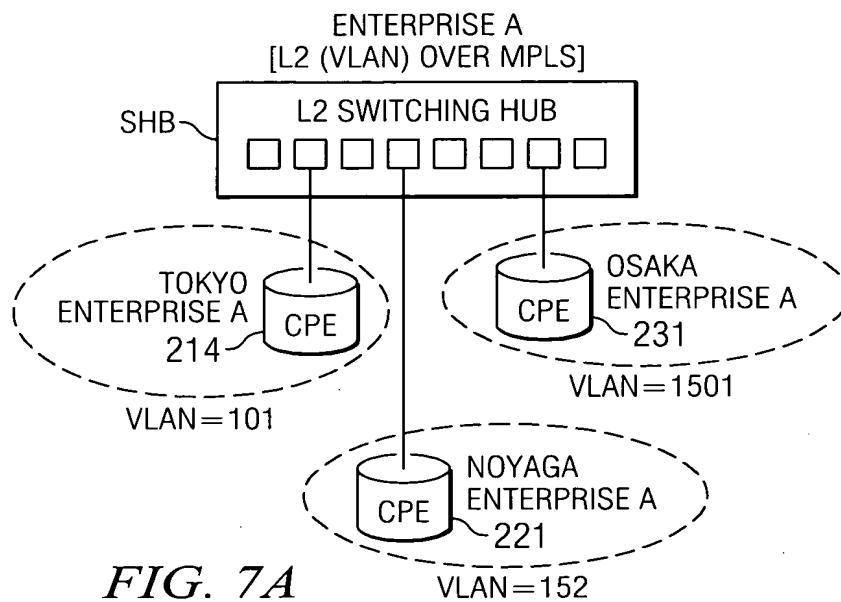


FIG. 7A

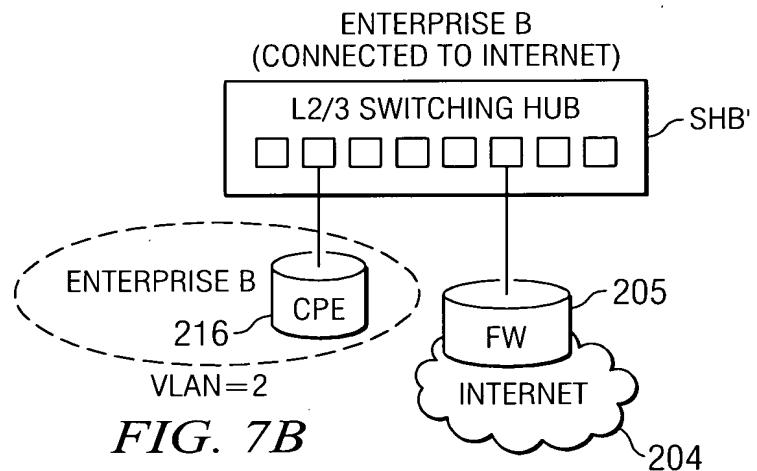


FIG. 7B

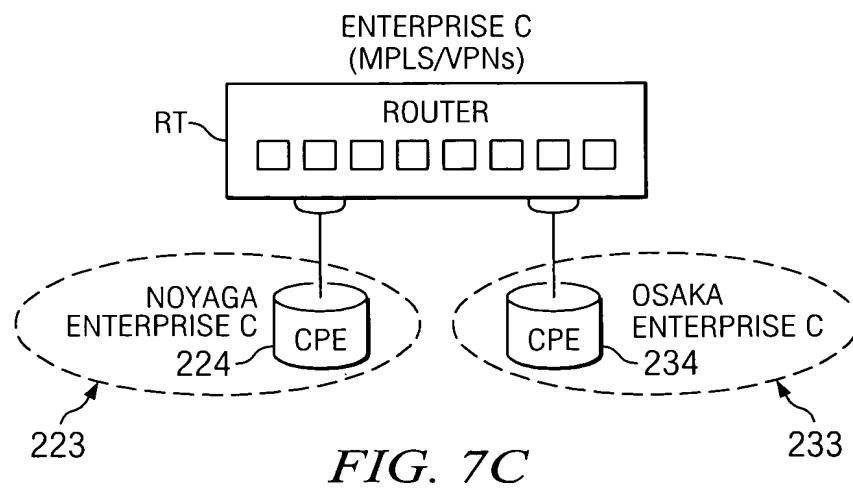


FIG. 7C

**VIRTUAL PRIVATE NETWORK (VPN) WITH CHANNELIZED
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Sheet 7 of 16

7/16

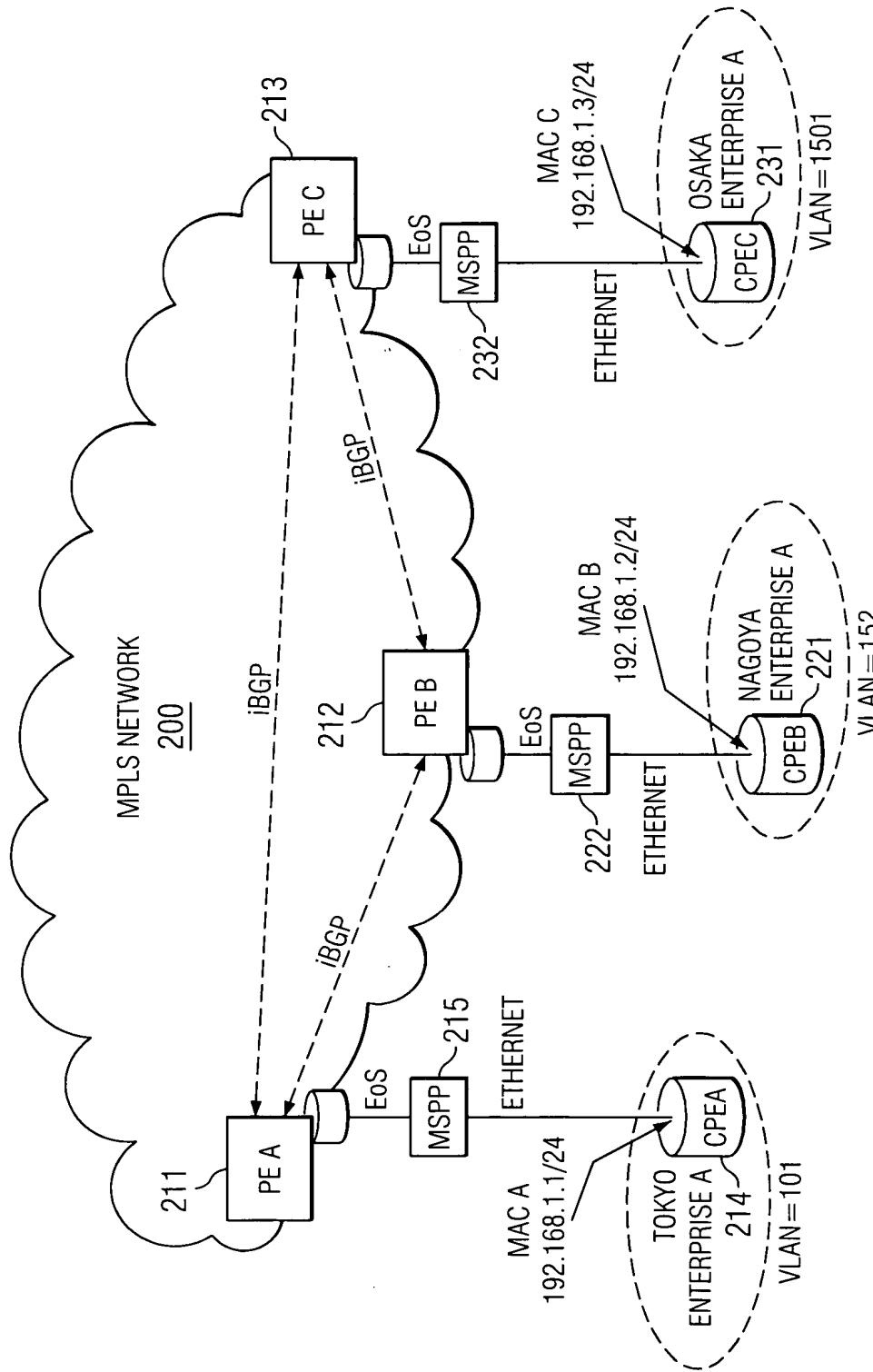


FIG. 8

VIRTUAL PRIVATE NETWORK (VPN) WITH CHANNELIZED ETHERNET OVER SONET (EoS) INTERFACE AND METHOD

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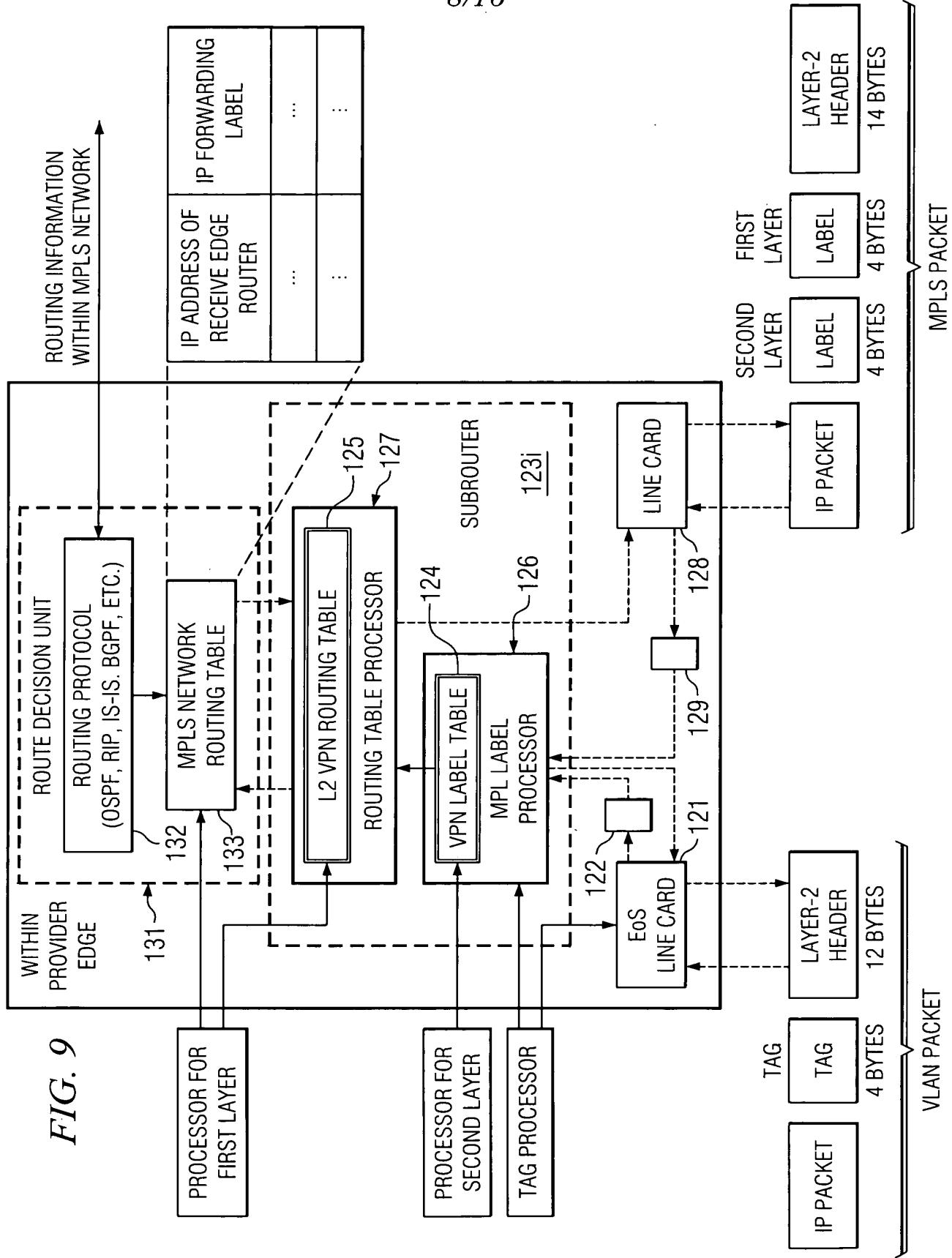
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Serial No.: 10/656,762

Filed: September 6, 2003

Sheet 8 of 16

8/16



9/16

FIG. 10A

(a) L2 VPN LABEL TABLE OF PE A

PE A #VPN IDENTIFIER		LABEL TABLE OF ENTERPRISE A		
VPN LABEL	L2 ADDRESS	OUTGOING I/F	VLAN ID (VID)	VPN <i>i</i>
26			101	COMPANY-A

VLAN ID AND VPN IDENTIFIER
ENTERED STATICALLY WHEN
VPN/VLAN IS SET UP

L2 VPN ROUTING TABLE OF PE A

PE A #VPN IDENTIFIER		ROUTING TABLE OF ENTERPRISE A		

125

FIG. 10B

(a) L2 VPN LABEL TABLE OF PE A

PE A #VPN IDENTIFIER		LABEL TABLE OF ENTERPRISE A		
VPN LABEL	L2 ADDRESS	OUTGOING I/F	VLAN ID (VID)	VPN <i>i</i>
26	MACA	EoS	0	COMPANY-A

L2 VPN ROUTING TABLE OF PE A

PE A #VPN IDENTIFIER		ROUTING TABLE OF ENTERPRISE A		
		LOOPBACK ADDRESS OF L2 MAC B VIA PE B; VLAN 152		
		LOOPBACK ADDRESS OF L2 MAC C VIA PE C; VLAN 1501		
		L2 MAC A IS DIRECTLY CONNECTED, ETHERNET0, VLAN 101		

SET UP BY iBGP

DIRECT CONNECT BECAUSE
CPE IS DIRECTLY
CONNECTED TO OWN PE

125

10/16

VPN TABLE OF ENTERPRISE A IN PE A

L2 VPN LABEL TABLE OF ENTERPRISE A				
VPN LABEL	OUTGOING I/F	MAC	VID	VPN <i>i</i>
26	EoS	MAC A	101	COMPANY A
L2 VPN ROUTING TABLE OF ENTERPRISE A				
L2	MAC B	LOOPBACK ADDRESS OF PE B; VLAN 152		
L2	MAC C	LOOPBACK ADDRESS OF PE C; VLAN 1501		
L2	MAC A	DIRECTLY CONNECTED, ETHERNET, VLAN 101		

FIG. 11A

VPN TABLE OF ENTERPRISE A IN PE B

L2 VPN LABEL TABLE OF ENTERPRISE A				
VPN LABEL	OUTGOING I/F	MAC	VID	VPN <i>i</i>
26	EoS	MAC B	152	COMPANY A
L2 VPN TABLE OF ENTERPRISE A				
L2	MAC B	DIRECTLY CONNECTED, ETHERNET, VLAN 152		
L2	MAC C	LOOPBACK ADDRESS OF PE C; VLAN 1501		
L2	MAC A	LOOPBACK ADDRESS OF PE A; VLAN 101		

FIG. 11B

VPN TABLE OF ENTERPRISE A IN PE C

L2 VPN LABEL TABLE OF ENTERPRISE A				
VPN LABEL	OUTGOING I/F	MAC	VID	VPN <i>i</i>
26	EoS	MAC C	1501	COMPANY A
L2 VPN LABEL TABLE OF ENTERPRISE A				
L2	MAC B	LOOPBACK ADDRESS OF PE B; VLAN 152		
L2	MAC C	DIRECTLY CONNECTED, ETHERNET, VLAN 1501		
L2	MAC A	LOOPBACK ADDRESS OF PE A; VLAN 101		

FIG. 11C

VIRTUAL PRIVATE NETWORK (VPN) WITH CHANNELIZED ETHERNET OVER SONET (EoS) INTERFACE AND METHOD

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Sheet 11 of 16

11/16

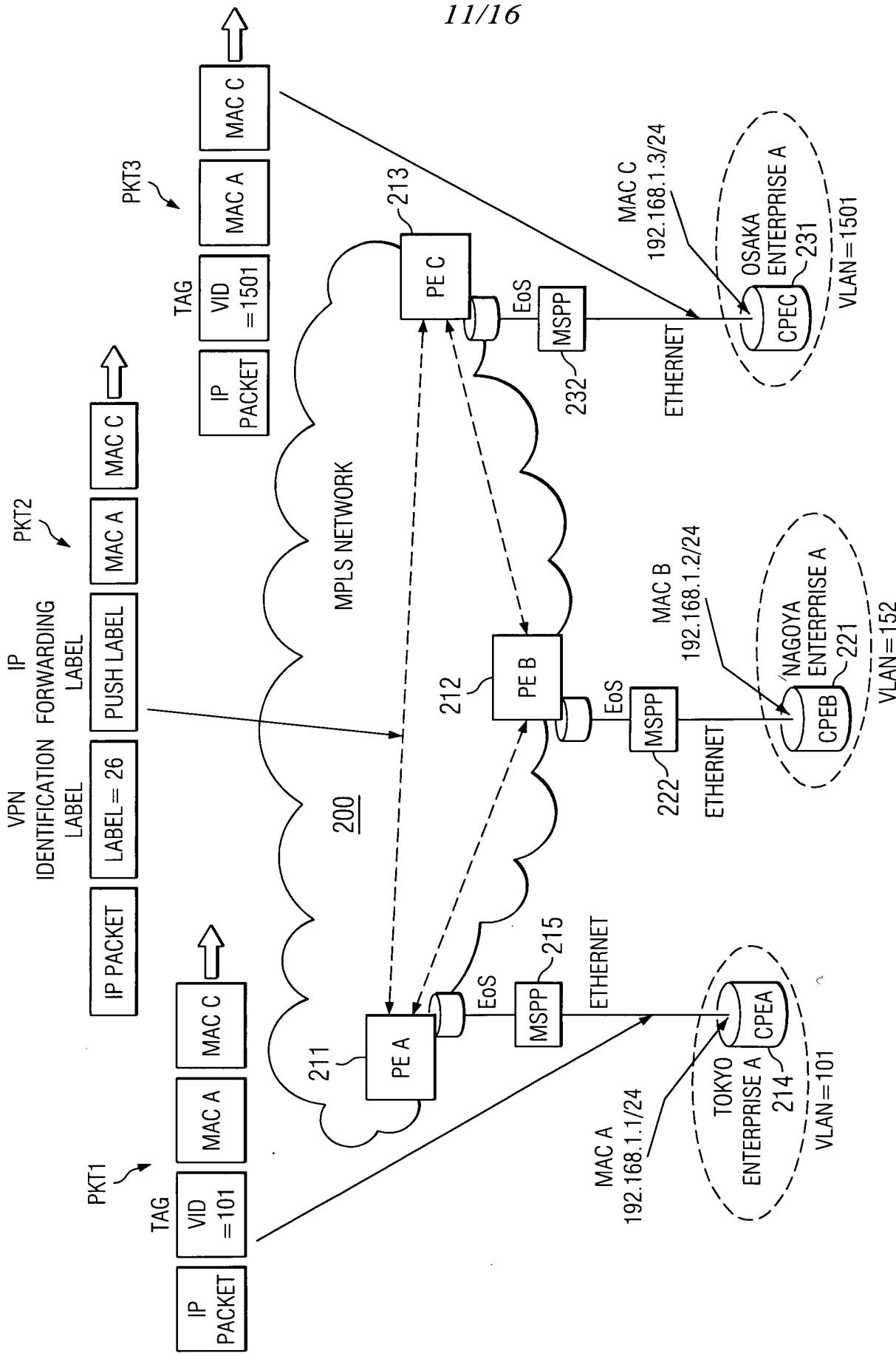


FIG. 12

12/16

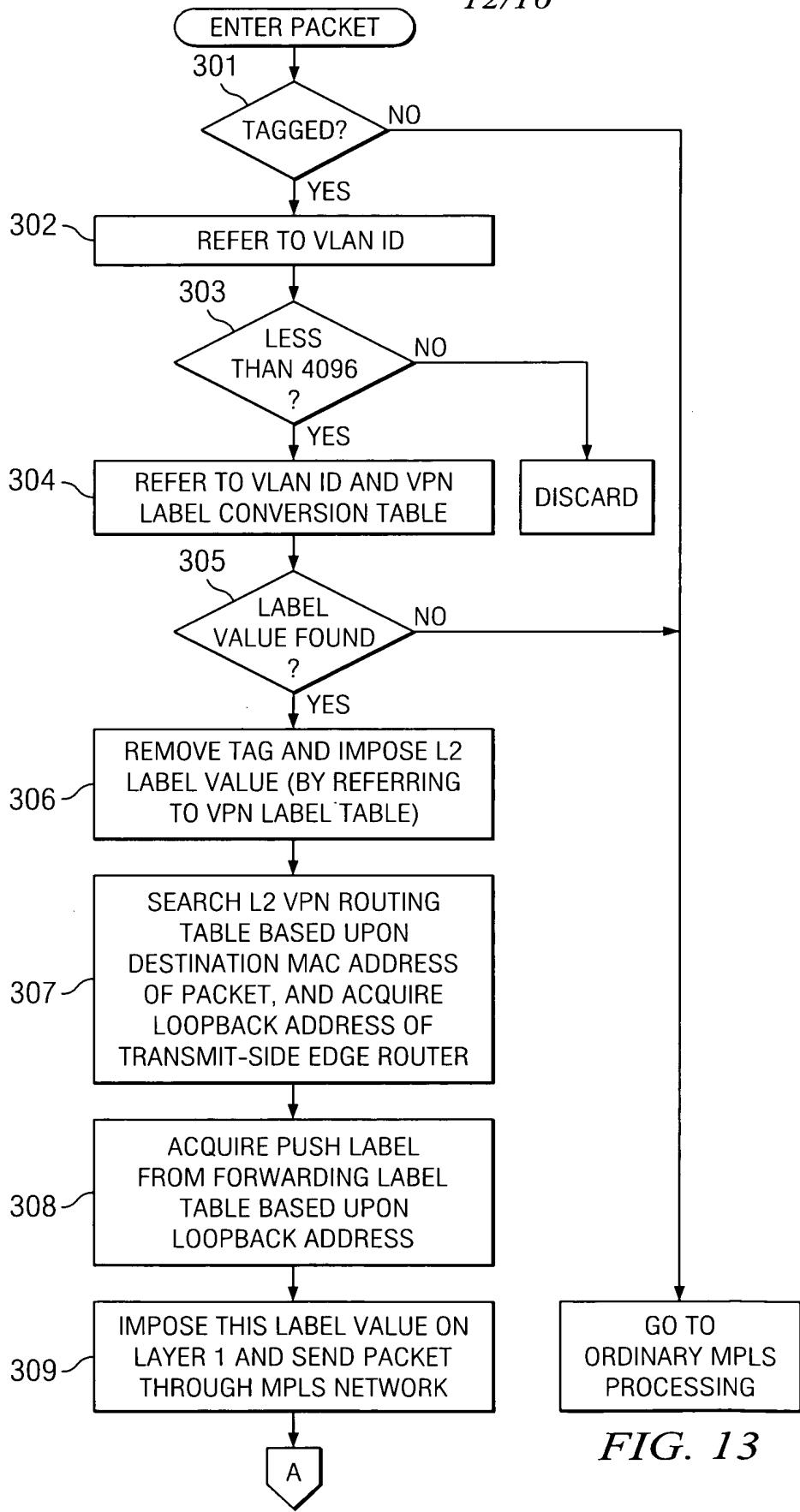


FIG. 13

TO FIG. 14

13/16

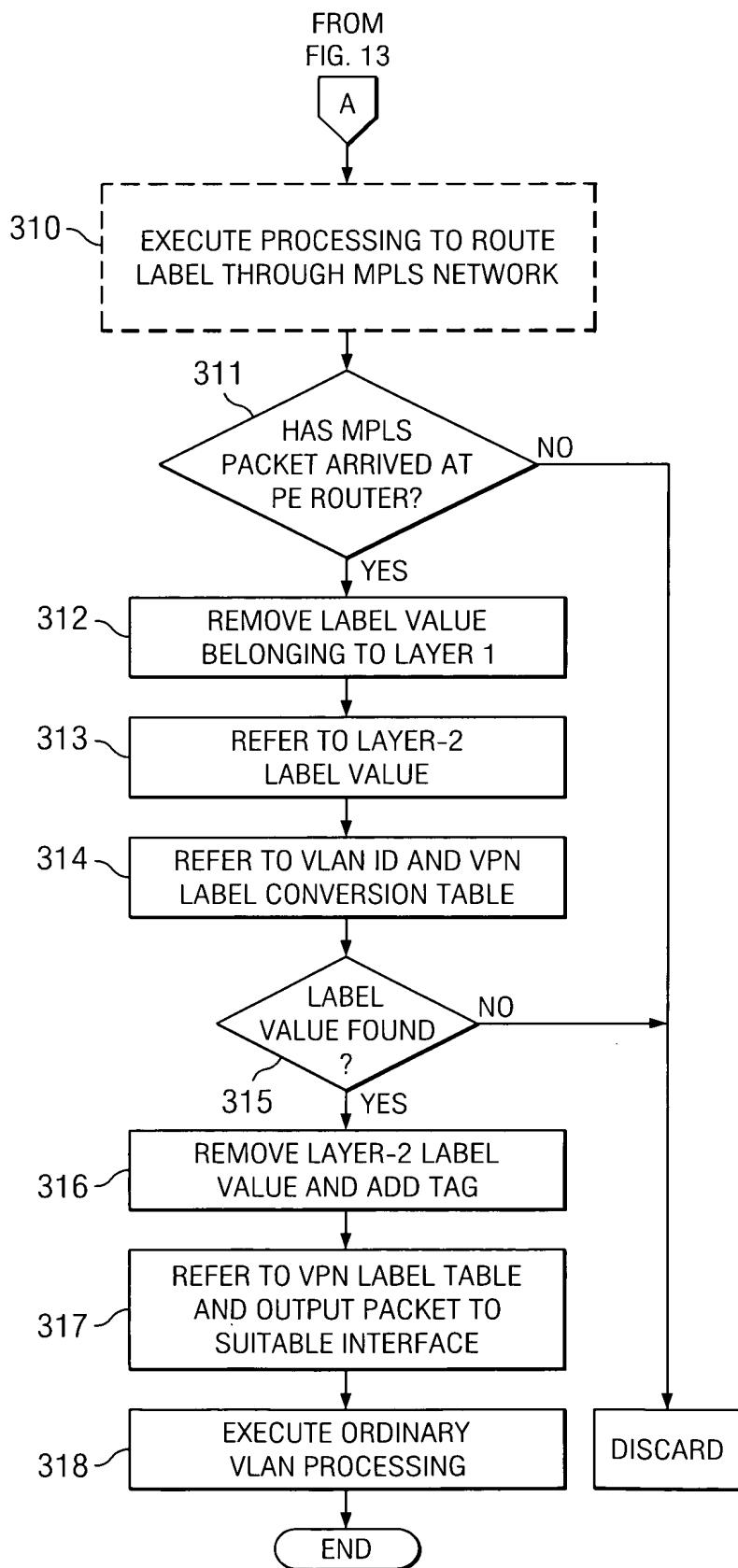
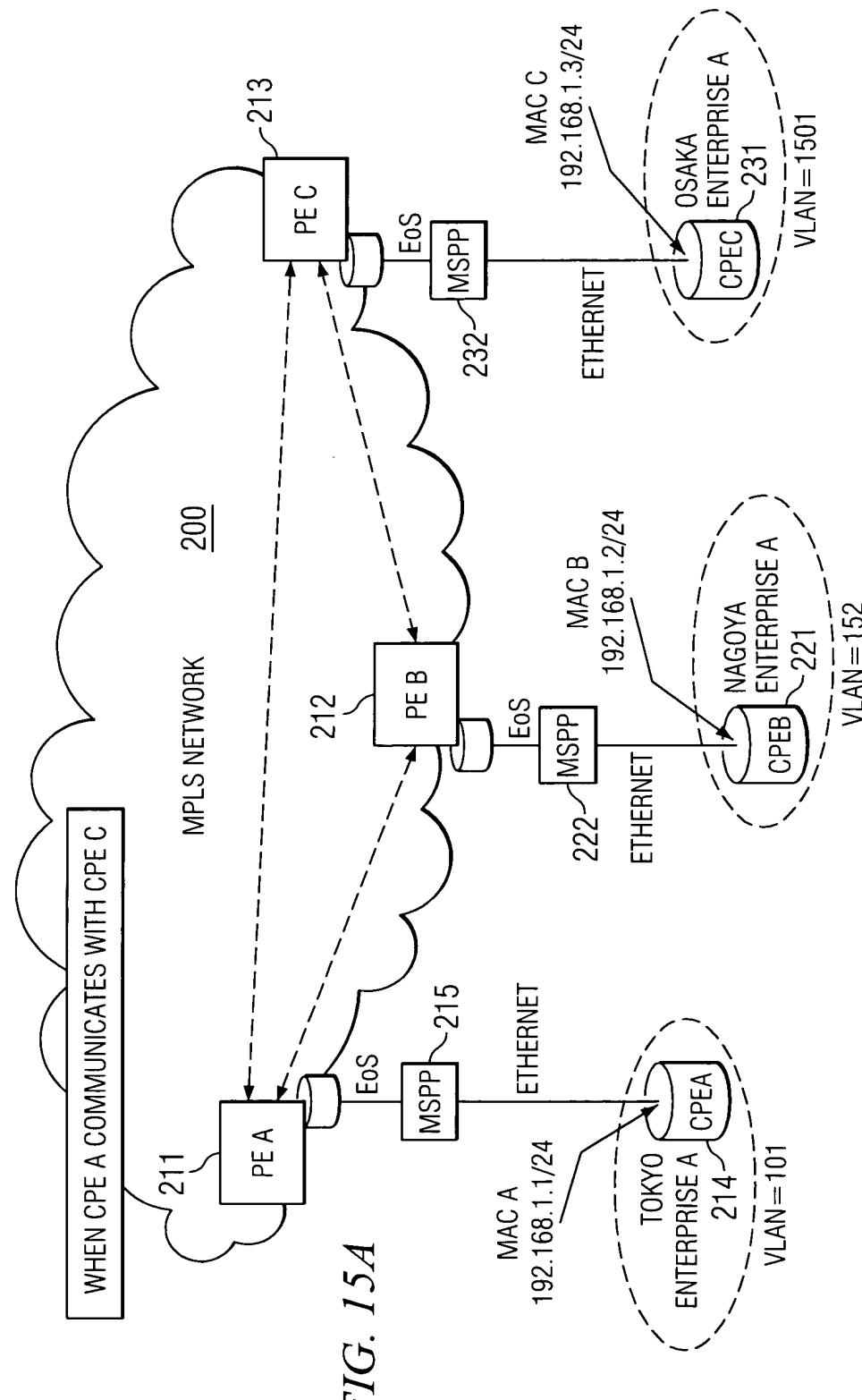


FIG. 14

14/16



15/16

1.	BROADCAST ARP PACKET DIRECTED TO CPE C (192.168.1.3) FROM CPE A
2.	IN CASE OF BROADCAST DIRECTED TO CPE C (192.168.1.3) FROM CPE A, CREATE COPY OF BROADCAST PACKET AT PE A AS NECESSARY AND SEND PACKET TO PE B, PE C
3.	SEND ARP-REPLY PACKET TO CPE A (192.168.1.1) FROM CPE C AUTOMATICALLY LEARN OR ENTER MAC ADDRESS OF EACH CPE IN L2 VPN LABEL TABLE, L2 VPN TABLE OF EACH PE

FIG. 15B

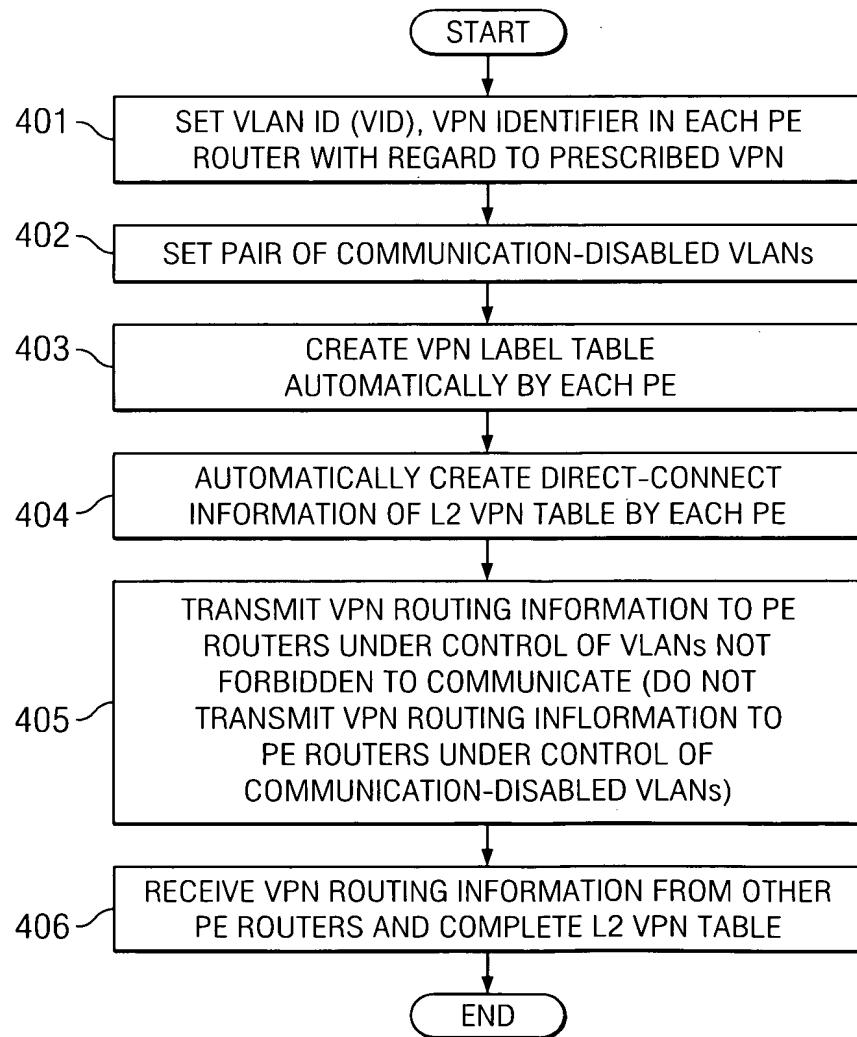


FIG. 16

16/16

FIG. 17A

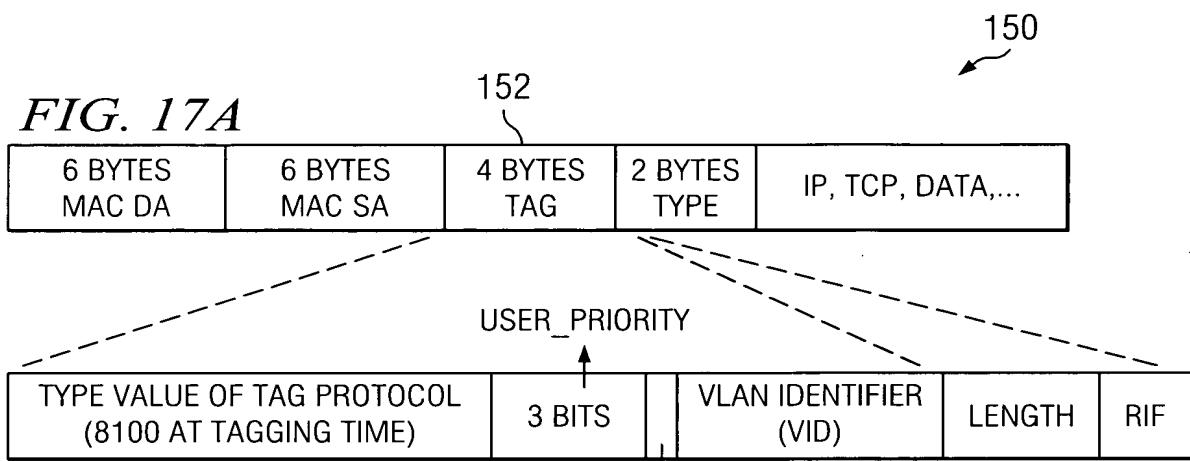


FIG. 17B

